

P30914

What is claimed is,

1. A piezoelectric actuator comprising: a first piezoelectric element unit, a second piezoelectric element unit and coupling portions, wherein said first piezoelectric element unit and said second piezoelectric element unit are coupled by said coupling portion.

5           2. The piezoelectric actuator according to claim 1, wherein said first piezoelectric element unit is arranged parallel to said second piezoelectric element unit.

10           3. The piezoelectric actuator according to claim 1, wherein said coupling portion is composed of a flexible resin.

15           4. The piezoelectric actuator according to claim 1, wherein said coupling portion is made from a material identical to used for protective layer to cover said first piezoelectric element unit and said second piezoelectric element unit.

20           5. The piezoelectric actuator according to claim 4, wherein said protective layer is composed of a resin.

25           6. The piezoelectric actuator according to claim 1, wherein a material of said coupling portion is partially removed so as to form a slit.

30           7. The piezoelectric actuator according to claim 6, wherein said coupling portion couples said first piezoelectric element unit and said second piezoelectric element unit at least in places near the ends of respective units and opposing sides of respective units.

35           8. The piezoelectric actuator according to claim 1, wherein said first piezoelectric element unit and said second piezoelectric element unit are formed from thin films respectively.

40           9. The piezoelectric actuator according to claim 8, wherein said first piezoelectric element unit and said second piezoelectric element unit form a multilayered structure using two thin film piezoelectric element bodies, each consists of thin film piezoelectric element covered by metal coating layer on top and bottom surfaces, with an adhesive layer disposed between the bodies.

45           10. The piezoelectric actuator according to claim 9, wherein said adhesive layer comprises a resin adhesive.

45           11. The piezoelectric actuator according to claim 9, wherein said adhesive layer is a weld coupling formed from both metal coating layers

P30914

welded together.

12. A disk drive comprising:

(a) a disk;

5 (b) a voice coil motor to rotate said disk;

(c) a slider including a magnetic head to record data to and/or  
reproduce data from said disk;

(d) a load beam to suspend said slider in one end;

(e) a carriage;

10 (f) a head actuator provided between said carriage and one disk  
side end of said load beam;

and

(g) a coupling portion,

15 wherein said head actuator has a first piezoelectric element unit,  
second piezoelectric element unit and a coupling portion, and said first  
piezoelectric element unit is arranged approximately parallel to said  
second piezoelectric element unit, and said coupling portion couples  
said first piezoelectric element unit and said second piezoelectric  
element unit.

20

13. The disk drive according to claim 12, wherein said coupling  
portion is provided with a slit, and said first piezoelectric element unit  
and said second piezoelectric element unit are coupled by said coupling  
portion at least in one end of said first piezoelectric element unit and  
25 said second piezoelectric element unit, and opposing surfaces of said  
first piezoelectric element unit and said second piezoelectric element  
unit.

30

14. A manufacturing method of a piezoelectric actuator comprising  
the steps of:

(a) forming a first electrode metal layer, a first thin film  
piezoelectric element and a second electrode metal layer sequentially on  
a first substrate;

35

(b) forming a third electrode metal layer, a second thin film  
piezoelectric element and a fourth electrode metal layer sequentially on  
a second substrate;

(c) bonding said second electrode metal layer to said third metal  
electrode layer;

(d) removing said first substrate;

40

(e) shaping a layered structure resulting from steps (a)-(d)  
including said first thin film piezoelectric element and said second thin  
film piezoelectric element into a prescribed shape by dry-etching;

(f) covering said shaped layered structure with a coating resin;

45

(g) patterning a prescribed shape of a slit on said coating resin;

and;

(h) removing said second substrate.

P30914

15. The manufacturing method of a piezoelectric actuator according to claim 14, wherein said first substrate and said second substrate are composed of single crystal material.

5

16. The manufacturing method of a piezoelectric actuator according to claim 14, wherein patterning, in addition to a prescribed form of slit on said coating resin, said coupling portion provided with said first piezoelectric element unit and said second piezoelectric element unit coupled at least in near one end and opposing side surfaces across said slit.

10